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THE PROBLEM OF THE MOLLUSCA OF BEAR LAKE AND UTAH LAKE, IDAHO-UTAH

BY JUNIUS HENDERSON

Bear Lake is situated in extreme southeastern Idaho and northeastern Utah, about equally divided between the two states. Utah Lake is some distance south of Salt Lake City, with Provo as the largest city on its shore. At many places along the shore of Bear Lake immense quantities of mollusk shells have been piled in windrows by the waves, a splendid example of the efficiency of waves in sifting and sorting materials which differ in size, shape and specific gravity, the upper portions of the shell heaps being washed quite free from sand in many instances. The predominant species in these windrows is *Carinifex newberryi*. Next in importance are *Lymnaea utahensis*, *Valvata humeralis californica*, *V. utahensis* and *Paludestrina longinqua*. In July, 1930, Mrs. Henderson and I scooped up about eight quarts of these shells at four widely separated localities and sorted them. Locality A, north end of the lake. B, east side not far from south end. C, west side, some distance south of Garden City. D, west side at Lakota resort. We recognize the following species:

	A	B	C	D
<i>Carinifex newberryi</i> (Lea)	x	x	x	x
<i>Physa ampullacea</i> (Gould)	x	x	x	x
<i>Lymnaea utahensis</i> (Call)	x	x	x	x
<i>Lymnaea</i> sp., of <i>palustris</i> group	x			
<i>Fluminicola fusca</i> (Hald.)	x	x	x	x
<i>Valvata humeralis californica</i> Pils.	x	x	x	x
<i>Valvata utahensis</i> (Call)	x	x	x	x

Paludestrina longinqua (Gould)	x	x	x	x
Planorbis vermicularis Gould	x			x
Planorbis exacuus Say	x			
Planorbis trivolvis Say	x			
Gonyodiscus cronkhitei anthonyi Pils.				x
Succinea sp., 1 broken specimen	x			
Pisidium compressum Prime	x	x	x	x
Sphaerium pilsbryanum Sterki	x	x	x	x
Anodonta californiensis Lea? (valve)				x

In 1917 Daniels and I (Proc. Acad. Nat. Sci. Phila., 1917, p. 58), from a more extended search of the north shore, reported from there also *Gonyodiscus cronkhitei anthonyi* Pils., *Vertigo ovata* (Say), *Planorbis parvus* (Say), *Lymnaea proxima* Lea and *Lymnaea stagnalis appressa* (*jugularis*) Say. The *P. parvus* should be *vermicularis*, *L. jugularis* was represented by a broken specimen, and *P. ampullacea*, *P. t. binneyi* and *L. proxima* are fresh-looking specimens, still retaining the epidermis, their state of preservation totally unlike that of the other species, such as *Carinifex*, *L. utahensis*, *Fluminicola*, etc. Probably the *L. "promixa"* is a case of mistaken identity. It should be more carefully studied.

Referring to the north end of the lake in our report just mentioned, we said: "The soil of this broad barrier is in places composed largely of fossil shells of the same species that abound along the beach, leading to the belief that the beach shells have been mostly washed from the sand by the waves and are fossil." We found no living mollusks in the lake. In "The Mollusca of Colorado", etc. (Univ. Colo. Studies, XIII, 181, 1924), under *Carinifex newberryi*, I said that "many of the shells were very fresh in appearance". That statement is misleading, resulting from quoting notes which referred to the whole collection, including *Planorbis binneyi*, etc., not applying to *Carinifex*, *Fluminicola*, *Valvata*, *Paludestrina*, etc., which constitute the great bulk of the beach material. The latter group have all lost their epidermis, the shell material of a large proportion of them has been altered and they have assumed a blue color, with surfaces often highly polished by wind and wave. Some speci-

mens have fragments of rather hard, sandy matrix clinging to them. Chamberlin and Jones (Descrip. Cat. Moll. Utah, Bull. Univ. Utah, XIX, 156-157, 1929) suggested that the bluish shells were fossil, and Sterki, in describing *Sphaerium pilsbryanum* from Bear Lake, designated it, with the associated *Planorbis*, *Carinifex newberryi*, *Lymnaea utahensis* and *Fluminicola fusca*, as fossils (NAUTILUS, XXII, 141-142, 1909).

In July, 1930, Mrs. Henderson and I made a much more thorough examination of this lake, and fully confirmed the belief that all of the shells lying in windrows along the beaches, except perhaps a few specimens at the north end, consist of fossils, washed out and sorted from the sand by the waves. We travelled entirely around the lake, examining the shores and the shallow water a little ways out. We also used a boat for dredging for several hundred feet out from shore on the west side, where beach shells were abundant. We did not find a single living mollusk in the lake, but there are some in sloughs near the lake, though not of the species found in the beach deposits. The water deepens very gradually from the shore out, and from the boat we could see the bottom on calm days 300 feet from shore and to depths of from 6 to 8 feet. The bottom was remarkably free from even dead or fossil shells, which were common only on shore or close to it. If they were being washed in from greater depths and are still living in the lake, the bottom off-shore should be as well supplied with them as is the shore itself.

Dr. Vasco Tanner, of Brigham Young University, Provo, Utah, has since been more thorough in his dredging. He has written me, under date of September 13, 1930: "I spent one week at Bear Lake and I had at my disposal one of the large motor boats and three men. I went around the entire lake with the boat, and I dredged at various depths from 50 feet to 190 feet, in the south and north ends and east and west sides, but did not collect a single living mollusk with my dredge net."

There is scarcely a doubt that these species, once so abundant in the lake, no longer live there. During the past 15

years or so the water level has retreated a long ways, due to the use of water for irrigation and power purposes. The water line is now far from the former shore line, and the present littoral conditions are not favorable to such mollusks as formerly populated the lake. This, in connection with the well-known fact that fluctuations in climatic conditions have caused great oscillations in western lakes within the not very remote (geologically speaking) past, suggests what probably destroyed the Bear Lake molluscan fauna. It is probable that the shrinkage of the lake during a cycle of decreased precipitation and perhaps increased evaporation, either entirely desiccated the lake or rendered it so saline as to be uninhabitable for mollusks of these kinds. Bearing upon this explanation, Dall suggested to me some years ago that the ribbed condition of many of the *Lymnaea utahensis* indicated saline conditions.

Around the shores of Utah Lake also many mollusk shells are found, of species which have not in recent times been found living in the lake, or in the adjacent streams or sloughs. We did not find them anywhere in such piles as we found at Bear Lake, except near the power plant at the north end, where they had evidently been washed out from mud thrown out by the dredge in digging a canal from the lake to the power plant; and at one locality near Provo, where they had evidently been washed out from the shore deposits by the waves. Here the most abundant species is an *Amnicola*, a genus not found living in the Sale Lake Basin or Rocky Mountain states. In travelling entirely around the lake the only living species we found in the lake itself is an *Anodonta*, fresh valves of which are also abundant on the beach near Provo, but we did find, in several streams, living species different from those found dead along the shore. Dr. Tanner, who has done much dredging in the lake and is continuing the work, had not, at the last account I had from him, found any living mollusks in this lake except *Anodonta*.

Call, in describing *Lymnaea utahensis*, which he obtained in Utah Lake, near Lehi, said "dentition unpublished", though on a preceding page he had said that "the dentition

differs from typical *R. ampla* Mighels very materially", thus indicating that he obtained the species alive. He also described the operculum of *Valvata utahensis*, dredged at the same place, so he probably found that alive. He says that *Carinifex newberryi* "was discovered living in Utah Lake", that living forms of *Fluminicola fusca* are common there, and that "numerous living examples" of *Lymnaea stagnalis* (*jugularis* or *wasatchensis*) occur in Utah Lake at American Fork. He says *Sphaerium dentatum* (probably meaning *pilsbryanum*, since described) "is a very abundant species in Utah Lake, where it attains a great size", but does not definitely say he found it alive. However, Sterki, in describing *pilsbryanum*, says it is fossil at Bear Lake and "recent" in Utah Lake, leaving us to surmise whether he actually had obtained live specimens from there. Some examples from American Fork retain the epidermis. In view of all this, what has happened? Are these species still living there, eluding the search for them, or have they been exterminated from the lake since Call's report was published? As with Bear Lake, the water level of Utah Lake has been much lowered within the past few years.

MOLLUSCA OF LAMB'S CANYON, UTAH

BY ELMER G. BERRY

University of Utah

Lamb's Canyon, a small tributary of Parley's Canyon, is situated about twenty-three miles from Salt Lake City. The altitude rises from about 7,500 feet at the mouth to about 11,000 feet at its head, a distance of only seven miles. The dense verdure and frequent rainfalls which occur in this canyon creates an ideal collecting ground for the conchologist. This canyon is typical of nearly all Salt Lake County canyons with similar altitudes. The list below comprises the collecting of three summers. The *Columella* is a new record